

III. *Part of a Letter from Mr Geoffrey, F. R. S.
to Dr Sloane, concerning the exact quantity
of acid Salts contained in acid Spirits.*

Paris, June 10. 1699.

I Believe M. Monro has written to you, what has been done in our publick meeting the 29th of *April*, in the Kings Palace called the *Louvre*, where since that day we meet weekly, therefore I send you only a short account of the discourse of Mr *Homborg*, Chymist of the Academy, his discourse was concerning the exact quantity of *Acid Volatile Salt* contained in Acid Spirits. And first he gives an account of the exactness required in Chymical Operations, not only in the quality of the matters which are to be mingled, but also in their quantity and doses, and for want of that exactness very often the experiments do not succeed. We have (says he) a very sure way for measuring the quantity of solids, by balances and ordinary weights, but we cannot come to the same precision in Liquors; and yet less, we can't know the precise quantity of the different matters contained in those Liquors, as what is the quantity of Acid Volatile Salt contained in Acid Spirits, for that purpose he has contrived a new *Aræometer*, or a measure of Liquors, of which here is the description,

A fig. 1. is a glass Bottle like a little *matracium*, of which the neck B C is so small that a drop of Water therein takes up the space of five or six lines, near that neck is a little Capillar tube D about six lines long, and parallel to the neck B C, in the opening B is a little dilated, fashion of a tunnel, for pouring more easily the Liquors in the Bottle, and the little tube D is for giving a way to the air contained in that Vessel to go out when the Liquor is poured in B, the point C is a little mark at the same height as the end of the little tube D.

When

When we fill that Vessel with some liquor for the experiments, we pour the Liquors into the Bottle by the opening B, until it goes out by the little tube D, and if the height of the Liquor is even to the mark C, 'tis well ; if it is lower, we must fill more to that point ; if it is higher, we must strike softly upon the opening B, till the overplus of the Liquor be even to the point C in the neck of the Bottle. By that means we have always exactly the same volume of Liquor, and we can know how the same volume of the several Liquors weighs more one than another precisely, but as the volume of Liquors is not always the same, and changes according to the alteration of the weather, now colder and then hotter, we must consider the variation of the weather, when we will do the Experiments in several times, and when we will compare the weight of the Liquor, which we weigh in Summer time, with the weight of an other, which we have weighed in Winter ; for the same Liquor being more rarefy'd in the hot time, and condens'd in the cold, the same volume of it will be more weighty in cold weather than in warm ; for that purpose M. *Homborg* has given us a Table of the various weights of some more usual Liquors in the coldest time and in the hottest, as it is underneath.

The Areometer full of Mercury, in the Summer time	3 3 gr.		in Winter	3 3 gr.	
	xi	o vi		xi	o xxxi
Full of Oil of Tartar	i iii	viii		i iii	xxx i
Spirit of Urine	i	o xxxii		i	o xliii
Oil of Vitriol	i iii	lviii		i vi	iii
Spirit of Nitre	i	i xl		i	i lxx
Spirit of Salt	i	o xxxix		i	o xlvii
<i>Aqua fortis</i>	i	i xxxviii		i	i lv
Vinegar	o vii	lv		o vii	lx
Spirit of Wine	o vi	xlvi		o vi	lxi
River Water	o vii	liii		o vii	lvii
Distilled Water	o vii	l		o vii	liiii
This empty Areometer weighs 3i and gr. xxviii.					

It

It appears by this Table that all Liquors, and likewise the Mercury are able to be condensed and rarefy'd in cold and hot weather.

For the quantity of the Volatil Acid Salt contained in the Acid Liquors, M. *Homburg* declared first what he intends by this Salt, and told us, the Acid Spirits were no other thing but a Salt dissolved by a little water, which the taste shews well enough for an acid, as also his effects, he calls it Volatile, because it is raised by the fire with the Phlegm, and it cannot be but hardly separated from that, and reduced in a dry form: what nevertheless M. *Homburg* has made in the operation inserted in the Memoirs of the Royal Academy, published the 15th of *December* 1692. by what operation it appears that the acid spirits are nothing but volatil acid salt and phlegm. The quantity of salt contained in a determined quantity of acid spirit was not yet known, but he has given a way to know it, and also he may say the quantity of salt contained in whatever acid spirit, only by the weight of volume, compared with the weight of another spirit, of which the quantity of salt contained in it was known, First, for knowing the quantity of volatile acid salt contained in some acid spirits, he has poured upon an ounce of salt of Tartar well dried the quantity of one acid spirit, as much as the salt of Tartar has been able to take of it, then he evaporated all the insipid humidity or Phlegma out of this salt, and he weighed the matter, the quantity of his weight, above the weight of the salt of Tartar before saturation, is the quantity of acid volatile salt contained in the quantity of acid spirit which has been taken by one ounce of salt of Tartar. Here is the Table of the quantity of acid that has been necessary to the perfect impregnation and fulness of the salt of Tartar, and by the same means the Table of the quantity of acid Volatile Salt, contained in one ounce of several acid spirits.

For

For the perfect impregnation of one ounce of salt of Tartar, was poured upon it spirit of Nitre $\text{ʒi. ʒii. gr. xxxvi.}$ the weight of that salt after the evaporation of the insipid humidity has been encreased to ʒiii. gr. x. above one ounce; that increase coming from the acid remained in the salt of Tartar, shews to us that one ounce of spirit of Nitre contains ʒii. gr. xviii. of acid salt.

So for the impregnation of ʒi. of salt of Tartar, has been poured upon it spirit of Salt ʒii. ʒv. the increase after the evaporation has been found ʒiii. gr. xiv. and therefore one ounce of spirit of Salt contains ʒi. gr. xv. of acid Salt.

Upon ʒi. of salt of Tartar has been poured oil of Vitriol ʒv. the increase has been found ʒiii. gr. v. therefore ʒi. of oil of Vitriol contains ʒiii. gr. lxxv. of acid Salt.

Upon ʒi. of salt of Tartar has been poured *Aqua fortis* ʒi. ʒii. gr. xxx. the increase has been found of ʒiii. gr. vi. therefore ʒi. of *Aqua fortis* contains ʒii. gr. xxvi. of acid Salt.

Upon ʒi. of salt of Tartar has been poured distilled Vinegar ʒxiii. the increase has been found of ʒiii. gr. xxxvi. therefore ʒi. of distilled Vinegar contains gr. xviii. of acid Salt.

It appears by this Table that the quantity of acid Salt for saturating the salt of Tartar is near the same, though the quantity of acid liquors should be very different; 'tis only the acid of Vinegar, of which the salt of Tartar retains more than it does of the others, that M. Homberg attributes to the subtilty of the particles of the vegetal acid, which have been very much divided by the alterations in the fermentation of the liquors in the Plants, &c. of the Wine, and also in the distillation, which alterations the mineral acid has not received. The vegetal acid by that subtilty of particles is able to impregnate a greater quantity of Liquor, than the

the same quantity of mineral acid, and by that it is more easily raised up by the fire than the others.

By these observations M. *Homberg* makes evident the reason of some cases, difficult to be explained without them: as, 'tis well known one ounce of *Aqua Regia*, compounded with the spirit of Nitre, and the ammoniac Salt, dissolves twice more Gold than one ounce of the spirit of Salt can do. The Chymists attribute that effect to the softness of the points of one acid, and to the hardness of the other: when these observations make evident that the spirit of Nitre contains twice more of acid Salt than the like volume of spirit of Salt, and open in the same time the true cause of this effect.

M. *Homberg* discours'd also how by the comparison of these two Tables we may know the quantity of acid Salt contained in an acid Spirit; which he doth in the following manner: He takes an acid spirit (as spirit of Nitre) he weighs it by his Areometer, and at the same time he weighs also distilled water (for the weight of the phlegm contain'd in the acid spirits is like as the weight of the distilled water) then he looks upon the Tables, where he sees that the bulk of spirit of Nitre compared with a like bulk of distilled water, has given a certain quantity of acid Salt for each ounce; and from thence he concludes, that the bulk of other spirit of Nitre, of which the weight is known, compared with the like bulk of water, shall give a determined quantity of acid salt, which will be raised by the computations of the relations of the weights of those spirits, with the weights of the like bulks of distilled water, by concluding from them and from the known product of acid salt for the unknown product of the same. All this will be more explained in the account which will be inserted in the Memoirs of the Academy.

